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| 10/002,979 | 12/06/2001 | Satoshi Maruyama | 216935US0 | 4984 |

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EXAMINER

CANTELMO, GREGG

ART UNIT PAPER NUMBER

1745

DATE MAILED: 09/15/2003

9

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/002,979

Applicant(s)

MARUYAMA ET AL.

Examiner

Gregg Cantelmo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3. 6) ☐ Other: _____

DETAILED ACTION

Priority

1. Applicant's claim to foreign priority is acknowledged.
2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

3. The information disclosure statement filed May 10, 2002 has been placed in the application file and the information referred to therein has been considered as to the merits.
4. The citing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited on an information disclosure statement or by the examiner on form PTO-892, they have not been considered.

For example, on page 20, at lines 11-12, the specification lists JP-A 11-276298. This reference is not cited on an information disclosure statement or form PTO-892.

Specification

5. The disclosure is objected to because of the following informalities:

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- a. the reference identified on page 20, lines 11-12 appears to be in error. JP-A 11-276298 is not drawn to the synthesis and preparation of a gelled solid electrolyte as stated in the instant application. A review of the abstract of this document shows that the particular reference is drawn to a chair. Applicant is advised to delete the reference number since it is not consistent with what the reference truly discloses;
- b. On page 5, at line 13, the term "batter" should be --battery--;
- c. On page 10, at line 31, the term "separate" should be --separator--;
- d. Applicant is advised to carefully review the specification for additional typographical errors.

Appropriate correction is required.

- 6. The use of the trademarks Unistall, Aquatex Adcot, Kynar, etc., have been noted in this application. They should be capitalized wherever they appear and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

Claim Objections

- 7. Claims 5 and 6 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend on a preceding multiple dependent claim, in this case, multiple dependent claims 5 and 6 are dependent upon multiple

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dependent claim 3. See MPEP § 608.01(n). For the purposes of expediting prosecution, the claims have been treated on the merits.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 3 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent No. 5,720,780 (Liu).

Liu discloses an electrode composition comprising a PVDF homopolymer (abstract). The electrolyte can be LiBF₄ (col. 8, ll. 24-27) and the solvent for the electrolyte can be a lactone, γ -butyrolactone in particular (paragraph bridging columns 7 and 8 as applied to claim 1).

With respect to the process of obtaining the PVDF homopolymer:

“[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted).

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“The Patent Office bears a lesser burden of proof in making out a case of prima facie obviousness for product-by-process claims because of their peculiar nature” than when a product is claimed in the conventional fashion. In re Fessmann, 489 F.2d 742, 744, 180 USPQ 324, 326 (CCPA 1974). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983). Ex parte Gray, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989). See MPEP section 2113.

The device is used in a lithium secondary battery (as applied to claim 3).

The PVDF, electrolyte salt and electrolyte solvent are all contained as solid electrolyte components (claim 4).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent No. 5,922,493 (Humphrey) in view of JP 06-290809-A (JP '809).

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Humphrey discloses an electrode composition comprising a PVDF homopolymer (abstract and col. 5, ll. 9-43). The PVDF is preferably formed by emulsion polymerization to provide for a high-purity polymer.

Humphrey uses KYNAR 741 homopolymer (see Table IV). Kynar 741 has an inherent crystallinity between 50 and 60%, thus greater than 30% and an inherent molecular weight of 323×1000 g/mol, thus greater than 50,000 (as applied to claim 2). Applicant is invited to review the manufacture's web page, in particular, <http://www.atofinchemicals.com/literature/pdf/19.pdf>. The literature therein discloses the crystallinity and molecular weight of Kynar.

The device is used in a lithium secondary battery (as applied to claim 3).

The PVDF is a solid component (claim 4).

The differences between instant claims and Humphrey are does not disclose of the salt being a lithium fluoroborate salt in a lactone solvent (claim 1), of the electrolyte further containing a cyclic carbonate in the volume ratio of 3/7-1/9 ethylene carbonate to γ -butyrolactone (claim 2), of the borate salt and lactone also being a solid component (claim 4).

JP '868 discloses that it is advantageous to provide a LiBF_4 electrolyte in a nonaqueous solvent containing over 50-95% vol. γ -butyrolactone (abstract and paragraphs [0049]-[0051] and [0153] as applied to claims 1 and 2).

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The motivation for using the electrolyte composition of JP '868 is that it provides a battery having improved charge-and-discharge cycling, a high current discharge property.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Humphrey by providing a LiBF₄ electrolyte in a nonaqueous solvent containing over 50-95% vol. γ -butyrolactone since it would have provided a battery having improved charge-and-discharge cycling, a high current discharge property.

12. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Humphrey in view of JP '868 as applied to claims 1-4 above, and further in view of U.S. patent No. 4,668,595 (Yoshino).

The differences not yet discussed are of the particulars of the cathode active substance (claims 5 and 6) and of the amount of γ -butyrolactone in the electrolyte (claim 5).

With respect to the amount of γ -butyrolactone in the electrolyte:

As discussed above, JP '868 teaches of using amount of γ -butyrolactone in the electrolyte in the range set forth in claim 5.

The motivation for using the electrolyte composition of JP '868 is that it provides a battery having improved charge-and-discharge cycling, a high current discharge property.

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Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Humphrey by providing a LiBF₄ electrolyte in a nonaqueous solvent containing over 50-95% vol. γ -butyrolactone since it would have provided a battery having improved charge-and-discharge cycling, a high current discharge property.

With respect to the particulars of the cathode:

Yoshino discloses of a lithiated cobalt oxide cathode wherein Sn is added to the cathode active material in an amount from 0.001-0.1 relative to 0.85-1.0 of cobalt (col. 4, ll. 10-52 and col. 11, ll. 46-52).

The motivation for providing an additive material of Sn to a lithiated cobalt oxide within the range of Yoshino is that it improves the cycling particularly in deep charging and discharging cycles (col. 4, ll. 35-52).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Humphrey by providing an additive material of Sn to a lithiated cobalt oxide within the range of Yoshino since it would have improved the cycling particularly in deep charging and discharging cycles.

13. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent No. 5,720,780 (Liu) in view of Humphrey and JP '868.

In the event that Applicant shows criticality of the process of obtaining the homopolymer:

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Liu discloses an electrode composition comprising a PVDF homopolymer (abstract). The electrolyte can be LiBF₄ (col. 8, ll. 24-27) and the solvent for the electrolyte can be a lactone, γ -butyrolactone in particular (paragraph bridging columns 7 and 8).

Liu uses KYNAR 741 homopolymer (see Example 2 and Tables I and II). Kynar 741 has an inherent crystallinity between 50 and 60%, thus greater than 30% and an inherent molecular weight of 323 x 1000 g/mol, thus greater than 50,000 (as applied to claim 2). Applicant is invited to review the manufacture's web page, in particular, <http://www.atofinachemicals.com/literature/pdf/19.pdf>. The literature therein discloses the crystallinity and molecular weight of Kynar.

The device is used in a lithium secondary battery (as applied to claim 3).

The PVDF, electrolyte salt and electrolyte solvent are all contained as solid electrolyte components (claim 4).

The differences between instant claim 1 and Liu are that Liu does not disclose of the PVDF obtained from emulsion polymerization (claim 1), the salt being a lithium fluoroborate salt in a lactone solvent (claim 1), of the electrolyte further containing a cyclic carbonate in the volume ratio of 3/7-1/9 ethylene carbonate to γ -butyrolactone (claim 2).

With respect to a PVDF polymer obtained from emulsion polymerization:

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Humphrey discloses an electrode composition comprising a PVDF homopolymer (abstract and col. 5, ll. 9-43). The PVDF is preferably formed by emulsion polymerization to provide for a high-purity polymer.

The motivation for employing a PVDF homopolymer obtained by emulsion polymerization is it that it would have provided a higher purity polymer.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Liu by employing a PVDF homopolymer obtained by emulsion polymerization since it would have provide a higher purity polymer.

With respect to the electrolyte being lithium fluoroborate and the solvent being a lactone and further of the electrolyte further containing a cyclic carbonate in the volume ratio of 3/7-1/9 ethylene carbonate to γ -butyrolactone:

Liu discloses that a number of electrolyte materials and solvents can be used in the battery of Liu. For example the electrolyte can be LiBF₄ (col. 8, ll. 24-27) and the solvent for the electrolyte can be a lactone, γ -butyrolactone in particular (paragraph bridging columns 7 and 8).

JP '868 discloses that it is advantageous to provide a LiBF₄ electrolyte in a nonaqueous solvent containing over 50-95% vol. γ -butyrolactone (abstract and paragraphs [0049]-[0051] and [0153] as applied to claims 1 and 2).

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The motivation for using the electrolyte composition of JP '868 is that it provides a battery having improved charge-and-discharge cycling, a high current discharge property.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Liu by providing a LiBF₄ electrolyte in a nonaqueous solvent containing over 50-95% vol. γ -butyrolactone since it would have provided a battery having improved charge-and-discharge cycling, a high current discharge property.

14. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu in view of Humphrey and JP '868 as applied to claims 1-4 above, and further in view of U.S. patent No. 4,668,595 (Yoshino).

The differences not yet discussed are of the particulars of the cathode active substance (claims 5 and 6) and of the amount of γ -butyrolactone in the electrolyte (claim 5).

With respect to the amount of γ -butyrolactone in the electrolyte:

As discussed above, JP '868 teaches of using amount of γ -butyrolactone in the electrolyte in the range set forth in claim 5.

The motivation for using the electrolyte composition of JP '868 is that it provides a battery having improved charge-and-discharge cycling, a high current discharge property.

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Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Liu by providing a LiBF₄ electrolyte in a nonaqueous solvent containing over 50-95% vol. γ -butyrolactone since it would have provided a battery having improved charge-and-discharge cycling, a high current discharge property.

With respect to the particulars of the cathode:

Yoshino discloses of a lithiated cobalt oxide cathode wherein Sn is added to the cathode active material in an amount from 0.001-0.1 relative to 0.85-1.0 of cobalt (col. 4, ll. 10-52 and col. 11, ll. 46-52).

The motivation for providing an additive material of Sn to a lithiated cobalt oxide within the range of Yoshino is that it improves the cycling particularly in deep charging and discharging cycles (col. 4, ll. 35-52).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Liu by providing an additive material of Sn to a lithiated cobalt oxide within the range of Yoshino since it would have improved the cycling particularly in deep charging and discharging cycles.

15. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshino in view of U.S. patent No. 6,106,973 (Sonozaiki) and JP 06-290809-A (JP '809).

Yoshino discloses a lithium secondary battery comprising a cathode, anode and electrolyte encased in a housing (abstract and figures), wherein the cathode is a lithium cobalt oxide material. Yoshino discloses of a lithiated cobalt oxide cathode wherein Sn

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is added to the cathode active material in an amount from 0.001-0.1 relative to 0.85-1.0 of cobalt (col. 4, ll. 10-52 and col. 11, ll. 46-52).

Yoshino discloses of a lithiated cobalt oxide cathode (col. 11, ll. 46-52) wherein Sn is added to the cathode active material in an amount from 0.001-0.1 relative to 0.85-1.0 of cobalt (abstract and prior art claim 1). The electrolyte can comprise a lactone solvent (col. 12, ll. 5-29 as applied to claim 7).

The element M is Sn (paragraph [0085] as applied to claim 8).

The differences between instant claims and Yoshino are that Yoshino does not disclose of the housing having a thickness of 0.3 mm or less (claim 7), or of the electrolyte solvent having 60-95% vol. γ -butyrolactone (claim 7).

With respect to the thickness of the housing:

Sonozaki discloses that it is known in the art to employ flat cell housings wherein the laminate has a combined thickness of 150 microns or less (col. 4, ll. 55-64 and col. 6, ll. 1-12).

The motivation for using the housing thickness of Sonozaki is that it provides a casing for the battery which has an efficient seal while also reducing the size of the battery and increasing the electric discharge capacity of the cell (col. 2, ll. 14-55).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Yoshino by modifying the thickness of the housing to be 150 microns or less as taught by Sonozaki since it would

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have provided a casing for the battery which has an efficient seal, reduced the size of the battery and increased the electric discharge capacity of the cell.

With respect to the electrolyte solvent having 60-95% vol. γ -butyrolactone:

Yoshino discloses that the electrolyte can be LiBF_4 and the solvent a lactone (see paragraphs [0058]-[0059]).

JP '868 discloses that it is advantageous to provide a LiBF_4 electrolyte in a nonaqueous solvent containing over 50-95% vol. γ -butyrolactone (abstract and paragraphs [0049]-[0051]).

The motivation for using the electrolyte composition of JP '868 is that it provides a battery having improved charge-and-discharge cycling, a high current discharge property.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Yoshino by providing a LiBF_4 electrolyte in a nonaqueous solvent containing over 50-95% vol. γ -butyrolactone since it would have provided a battery having improved charge-and-discharge cycling, a high current discharge property.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (703) 305-0635. The examiner can normally be reached on Monday through Thursday from 8:00

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a.m. to 5:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan, can be reached on (703) 308-2383. FAX communications should be sent to the appropriate FAX number: (703) 872-9311 for After Final Responses only; (703) 872-9310 for all other responses. FAXES received after 4 p.m. will not be processed until the following business day. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Gregg Cantelmo
Patent Examiner
Art Unit 1745

gc

A handwritten signature in black ink, appearing to read "Gregg Cantelmo", with a long horizontal flourish extending to the right.

September 8, 2003